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To: Mr. R. Wilson
Director
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US EPA SYMPOSIUM ON ELECTROMAGNETIC FIELD MEASUREMENTS FOR HAZARD ASSESSMENT OCTOBER 9-12, 1984, LAS VEGAS, NEVADA

S.M. Harvey

PURPOSE OF SYMPOSIUM

The need to measure radio frequency field intensities to evaluate potentially hazardous exposure situations has become important in recent years. Technical complexities such as measurement equipment design differences; highly spacially variable structure of ambient electromagnetic fields; modulation properties of the fields; intermittent nature of emissions from rotating radar antennas and low duty-cycle communications equipment; multiplicity of fields of more than one frequency; and adverse climatic conditions can affect instrument response and contribute to the measurement problem. The primary purpose of this symposium is to identify these problems and to discuss the limitations of available instrumentation.

RELEVANCE TO ONTARIO HYDRO

Electromagnetic fields are produced by Ontario Hydro power and communications facilities, and also by electrical apparatus including office equipment used by staff. Awareness of electromagnetic (EM) field levels and possible hazards will ensure safe workplace practices.

Concerns presently fall into two broad categories:

1. Thermal effects caused by absorption of energy in the body, mainly associated with communications and radar antennae but also with rf devices such as induction heaters.

2. Weak-field (non-thermal) effects associated with power distribution systems and apparatus such as video display units (VDUs). The latter category is quite controversial and is of relevance to the Ontario Hydro HAVDU program.

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The symposium also provided an opportunity to present a paper on VDU field measurements to a professional audience.

NATURE OF THE PROBLEM

The complete characterization of a sinusoidal (cw) free space electromagnetic field requires measurement of 7 parameters at each point in space. Plane-wave cw radiation requires only 4 parameters, since some are interdependent. For general nonsinusoidal fields, more than 7 parameters are required for each point. Ideally, the distribution of the field parameters over the human body as well as the duration of the exposure should be known for the purpose of assessing biological hazards.

This measurement procedure, even with excellent test equipment, is difficult. Some of the difficulties were discussed in this EPA Symposium that was attended by about 120 people connected with the physical and health sciences.

PROCEEDINGS

The symposium proceedings fell into three general categories: Instrumentation, Measurement Procedure, and Regulation. Most of the discussions addressed problems of measuring for thermal effects, as this is the area in which most work is being done. However, some of the participants were actively involved with non-thermal exposures including VDUs.

Instrumentation technology, mainly for the radio and microwave frequencies, is improving rapidly. Generally broadband survey instruments are now accurate and relatively simple to use. However, analytical instruments, required for detailed surveys, are still very complex and expensive.

Measurement procedures are very critical. It was repeatedly emphasized that knowledgeable and experienced personnel were essential for proper and useful measurements. Generally, the measurement procedure must be tailored to the specific problem and numerous examples were given.

Regulation is controversial because of the difficulties of enforcement (see above). Although some regulation is in place, environmental impact surveys are more common. Regulation is likely to be based on a voluntary standard, ANSI C95.1 - 1982. This is a rather complex document designed to limit thermal effects in or shock hazards to the human body. Contrary to some opinion, this standard does not place a specific limit on the electric or magnetic fields to which the body may be exposed.

Although some of the principal investigators of the VDU problem were present, my paper was the only one on this topic. It attracted considerable interest.

USEFUL CONTACTS - HAVDU PROJECT

R.A. Tell, Office of Radiation Programs, EPA Symposium organizer; has undertaken some VDU measurements and attempted to replicate (unsuccessfully) the Delgado experiments that suggest a teratogenetic effect from weak magnetic fields that are similar in some respects to VDU magnetic fields.

K.H. Mild, National Board for Occupational Safety and Health, Sweden; has partially replicated the Delgado experiments.

A.W. Guy, University of Washington, Washington; has completed an extensive survey of VDUs for IBM. Unfortunately the survey report is still confidential, but a summary is available. Indicated that data are in good agreement with Ontario Hydro data.

M.M. Weiss and R.C. Peterson, Bell Laboratories, published one of the early papers on VDU measurements. Are still actively involved in VDU measurements.

CONCLUSIONS

This was a very interesting symposium that provided a good picture of the state of the art in electromagnetic field measurement and hazard assessment. Useful contacts were made that will assist in collecting more information about VDU measurements and weak-field biological experiments.

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Submitted

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